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(71) Applicants
Christopher James Nutt,
8 Field House Lane, Marple, Cheshire.
Philip Clayton,
13 Watford Road, New Mills, Derbyshire

(72) Inventor
Christopher James Nutt

(74) Agent and/or Address for Service
Appleyard Lees & Co,
15 Clare Road, Halifax HX1 2HY, West Yorkshire

(54) Vapour generator

(57) There is shown a steam generator for use in stripping wallpaper comprising a reservoir 12 which supplies water to a boiler 10 through a feed pipe 14 including a non-return valve 16.

An electric element in the boiler heats up and boils the water in the boiler 10. The steam is passed out through a pipe 28 to a steam application head (not shown).

The reservoir can be filled with water through an opening 20 which is beneath the uppermost portion of the reservoir to prevent overfilling of the reservoir.

A pressure relief valve 30 is provided in the reservoir.

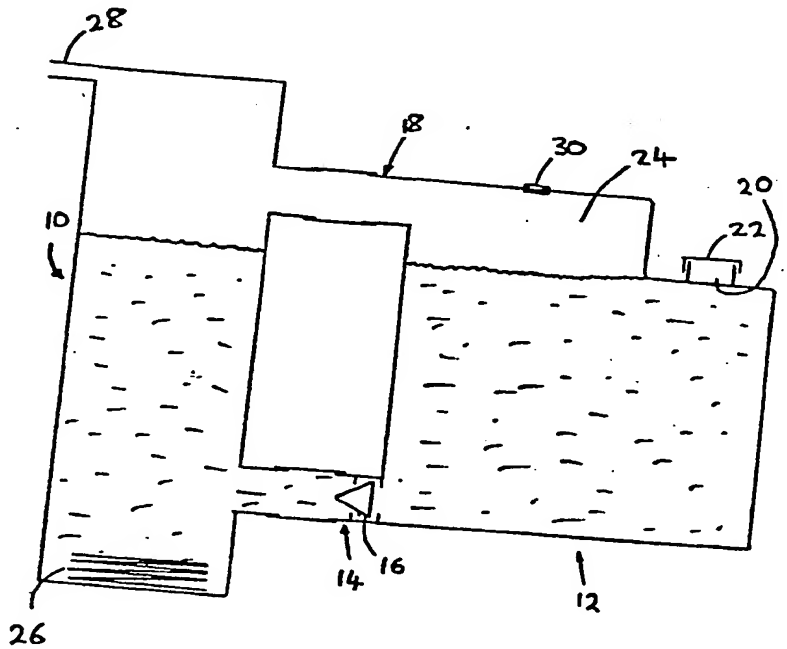

FIG 1

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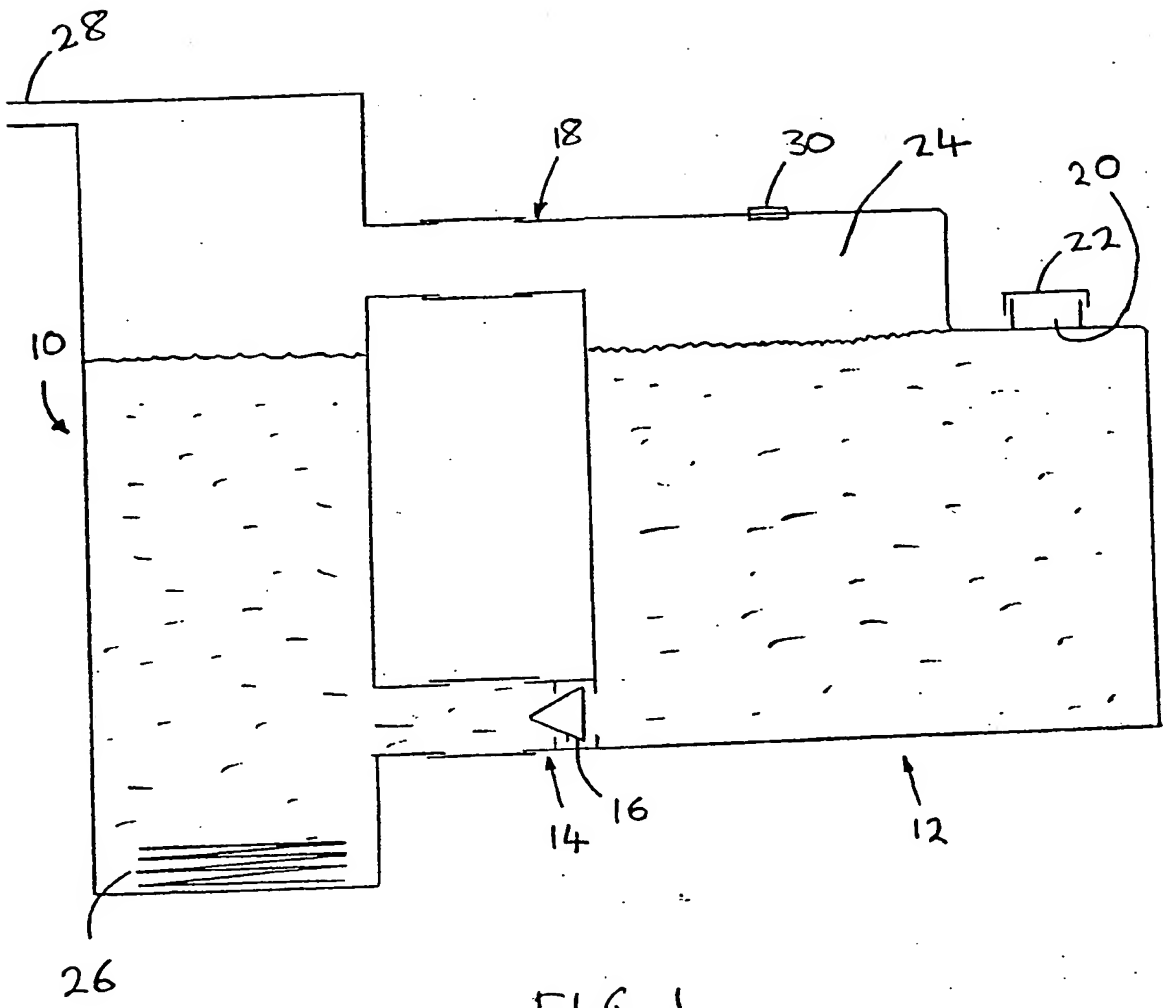

FIG 1

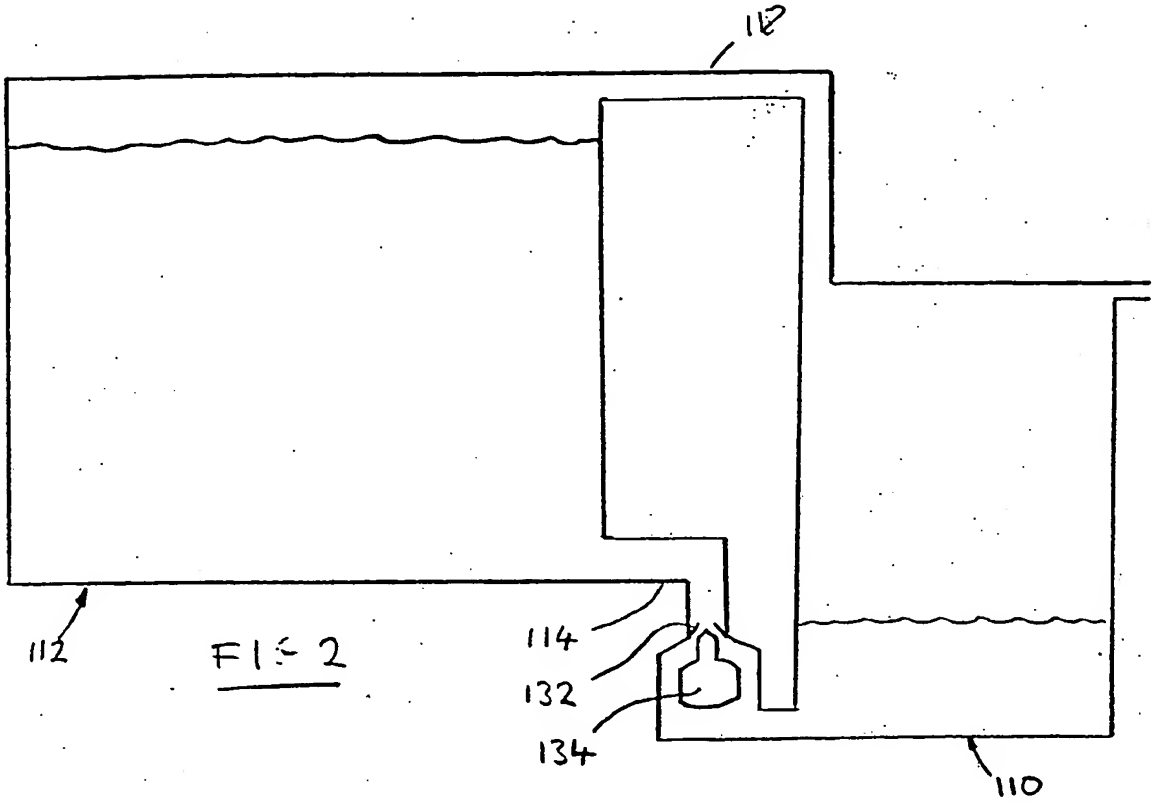

FIG 2

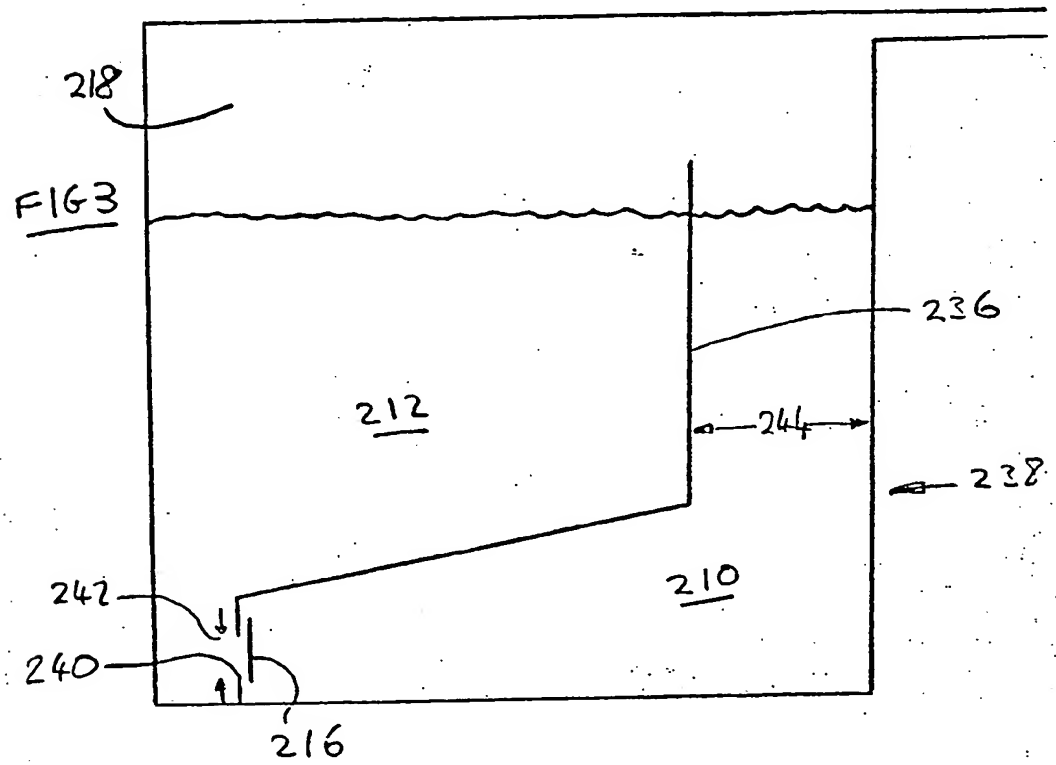

FIG3

SPECIFICATION

Vapour generator

The present invention relates to a vapour generator which is particularly, although not exclusively suitable for use in generating steam which is used for stripping wallpaper.

In a known generator of steam which is used to strip wallpaper, water in a tank is heated by an electric element located within the tank or by a gas burner. One of the main disadvantages of the tanks is that its capacity is in the region of 10 litres, and thus there is a considerable delay of typically 30 minutes from commencing heating of cold water to the generation of steam. Furthermore, as the tank has to be made fairly large in order to hold the volume of water, and as the tank is usually made from stainless steel it is expensive to manufacture. A further disadvantage is that when the water within the tank is heated, should the tank be knocked over then a large amount of hot water may spill out and possibly harm a person in the immediate vicinity. The generator also wastes energy not only because all of the water in the tank has to be heated in order to obtain a small volume of steam (should that be all that is required) but also because of the large external surface area of the tank which allows great heat loss to the environment.

According to one aspect of the present invention, a vapour generator includes a boiler portion and a reservoir portion arranged to supply liquid to the boiler portion. With such a generator, only the liquid located in the boiler portion needs to be heated to generate vapour and thus vapour may be generated in a relatively short period of time compared to the time taken in obtaining vapour by heating the combined volume of the liquid in the reservoir and boiler portions. Furthermore, the boiler portion may be fairly small in size which reduces its cost of manufacture, particularly when it is made from stainless steel. Additionally, the external surface area of the boiler portion is relatively small thus reducing heat loss to the environment. A further advantage is that, should the boiler portion be knocked over, then only a relatively small amount, if any, of the hot liquid can escape.

The capacity of the boiler portion may be less than 5 litres, for instance less than 4 litres or between 2 and 3 litres, and the capacity of the reservoir portion may be less than 15 litres, for instance in the region of 10 litres. Thus a generator may be provided which is able to produce the required amounts of vapour and which is readily portable.

The reservoir portion and the boiler portion are preferably spaced from each other and may be located adjacent to each other which may help in preventing undue amounts of heat transfer from the boiler portion to the reservoir.

The steam generator may be portable, and the reservoir portion and the boiler portion may be connected together to assist in allowing the generator to be portable.

The reservoir portion and the boiler portion may be provided in a single container. The container may include a partition, on each side of which is located a different one of the reservoir and boiler portions. This arrangement provides an extremely compact unit which may be readily portable. The partition may not completely cut off the upper part of the boiler portion from the upper part of the reservoir portion to allow the pressures in the two portions to equalise. By providing the partition between the two portions some preheating of the water in the reservoir may take place to allow vapour to be produced at an increased rate. Alternatively, the partition may serve to insulate the two portions from each other and thus tend to prevent passage of heat across the partition.

The reservoir portion may be arranged to supply fluid to the boiler portion *via* a one way valve which may prevent or inhibit the passage of fluid from the boiler to the reservoir. The one way valve may be comprised by a float valve. By arranging the float valve to be at the same height as the liquid level in the boiler portion, the boiler portion can be arranged to have only a very small amount of liquid therein at any one time. This further reduces the time in which vapour can be produced when starting up the generator from cold, and the height of the boiler portion can be produced thus saving in the cost of material required to make the boiler portion. Thus, the boiler portion may be arranged to have a lower liquid level than that of the reservoir portion.

The interior of the upper portions of the boiler portion and the reservoir portion may be in communication with each other whereby the internal pressures of the boiler and reservoir portions may be substantially the same. This feature helps allow liquid to pass from the reservoir portion to the boiler portion, it being appreciated that if the pressure in the boiler portion were to rise above that of the reservoir portion, then liquid may be inhibited from flowing into the boiler portion. It also permits a pressure relief valve to be fitted to the reservoir portion which will allow cool vapour or water to be vented to the environment, rather than the hot vapour or water present in the boiler portion, should the pressure need relieving. When the reservoir and boiler portions are spaced from each other, the interior of the upper portions may be connected together by a conduit or pipe, for instance a pressure balance pipe.

The reservoir may include means for preventing the reservoir portion from being completely filled with liquid. For example, a filling

opening for the reservoir portion may be arranged to be located beneath the uppermost portion of the reservoir portion, when the reservoir portion is in its normal or free standing position.

The reservoir portion may be arranged to supply liquid to the boiler portion at a location above the lowermost portion of the boiler portion. Thus liquid may be arranged to be supplied to the boiler portion at a point located above any electrical heating element in the boiler portion. The lower part of the reservoir portion may be located above the lower part of the boiler portion. Thus, providing the reservoir portion has some liquid present, the boiler portion may be arranged also to have some water present.

It will be appreciated that the reservoir portion may be made of any suitable material, for instance plastics, from which it is cheap and easy to manufacture a reservoir portion of the required shape. Furthermore, part or all of the reservoir portion may be transparent to permit the liquid level in the reservoir portion to be easily inspected.

Whilst the specification generally refers to water being supplied to the boiler portion, it will be appreciated that the present invention is applicable to any liquid solution which can be heated to give vapour.

The invention may be carried into practice in various ways, but various embodiments will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a cross-section through a steam generator for use in stripping wallpaper;

Figure 2 is a view similar to Figure 1 of a further embodiment of a steam generator, and

Figure 3 is a view similar to Figure 1 of another embodiment of a steam generator.

The steam generator shown in Figure 1 includes a boiler 10 and a reservoir 12. The reservoir supplies water to the boiler through a feed pipe 14 of approximately 21 mm diameter, which includes a non-return valve 16, and the upper portions of the boiler and reservoir are in communication with each other through a pressure balance pipe 18 of approximately 25 mm diameter. Both the feed pipe 14 and the pressure balance pipe 18 include a flexible connector.

The generator is started and operated as follows. Water is poured into the reservoir through an opening 20 to the required level and the opening is then closed and sealed by a cap 22. The height of water within the reservoir is limited as the opening 20 is located beneath an upper pocket 24 of the reservoir and thus air will always be present in this pocket 24. Water flows through the feed pipe 14 and into the boiler. An electric element 26 located towards the bottom of the boiler then heats the water within the boiler until steam is generated, the steam being passed by a pipe 28 to a steam application head (not shown).

As steam is forced out of the pipe 28, so the water level within the boiler will tend to drop. To compensate for this, and to keep a reasonable level of water within the boiler, water is continually able to be supplied from the reservoir through the feed pipe. It will be appreciated that the pressure within the boiler rises as steam is generated, and in order to prevent that increased pressure from hindering the passage of water from the reservoir into the boiler, the reservoir is also pressurised via the pressure balance pipe 18 connected to the pocket 24 of the reservoir. It will be appreciated that the pressure balance pipe is located above the maximum water level of the reservoir, and above the expanded boiled water level in the boiler, whereby the openings at either end of the pipe do not become submerged.

The reservoir is provided with a pressure relief valve 30 which vents to the atmosphere when the pressure within the boiler, and consequently the pressure within the reservoir, rises above a predeterminged value, such as may occur if the steam outlet is blocked. The gas, liquid or vapour which is vented through the valve will be cold relative to the temperature within the boiler. Instead of, or in addition to the pressure relief valve 30, the filler cap 20 could be adapted to vent to the atmosphere when a predetermined pressure is reached, or a pressure relief valve could be included in the reservoir.

The feed pipe 14 extends from the bottom of the reservoir to a point located just above the electric element 26 in the boiler. Thus, as long as water is in the reservoir, the element will be covered. To assist in inspecting the water level in the reservoir a part, or all of the reservoir can be made transparent. Thus the reservoir may be made of plastics which is not only easy and cheap to manufacture but can also be conveniently moulded to the required shape, which is of particular advantage when forming the upper pocket 24.

The electric element 25 extends in a generally horizontal direction in order to impart a less violent action to the water when it is boiling than would a vertically extending element. The element is rated at between 2 and 3 KW and includes a thermostat protector (not shown) which cuts off the power supply if the temperature of the element exceeds a predetermined value. Instead of heating the water in the boiler electrically, it will be appreciated that a gas burner could be used. As an alternative or additional safety device, a level switch may be mounted in the reservoir which cuts out the heat to the water in the boiler when the water level falls below a predetermined level. A further option is to provide a pressure detector to switch off the element when the pressure exceeds a predetermined

maximum.

The boiler has a water capacity of between 2 and 3 litres and is made of stainless steel and the reservoir has a water capacity of about 10 litres. The small boiler is thus easy to lag in order to reduce heat loss. It will thus be seen that the steam can be generated quickly as only the water in the boiler has to be heated, but that steam can be generated for a long duration as the boiler can be supplied with water from the large reservoir. The non-return valve 16 is particularly important where the water in the boiler is reheated and the pressure within the generator could be such that hot water could be driven back along the feed pipe into the reservoir. Clearly any such hot water may damage the plastics reservoir.

In Figure 2, like parts to those in Figure 1 have been given the same reference numeral prefixed by the number 1. The boiler 110 and the reseroir 112 are connected together by the pressure balance pipe 118 and the feed pipe 114. The lower end of the feed pipe 114 projects downwardly towards the bottom of the reservoir and includes a valve seat 132 arranged to be engaged by a float valve 134. It can be seen that the water level in the boiler 110 is maintained at an extremely low level by operation of the float valve 134 thus reducing the time taken to heat up the water in the boiler sufficiently to produce steam. A further consequence of the low water level in the boiler is that the volume of the boiler is reduced and thus the cost of the material used to make the boiler, and the time taken to form the boiler is reduced.

In Figure 3, like parts to those in Figure 1 have been given the same reference numeral prefixed by the number 2. As shown in Figure 3, a portion 236 divides a tank 238 into a boiler 210 and a reservoir 212. The partition does not extend to the top of the tank and a pressure balance opening 218 is provided between the boiler and the reservoir.

A one-way or non-return valve 216 is provided at the bottom of the partition to allow water to flow from the reservoir to the boiler.

In an alternative embodiment (not shown) the valve 216 is omitted and water is able to flow directly through the opening 240 in the partition from the reservoir to the boiler. In this embodiment, the height of the opening, shown at 242, is preferably equal to or greater than 10 times the width of the upper part of the boiler shown at 244. The opening 240 may be provided between the bottom of the partition and the bottom of the tank instead of being in the partition, as shown.

The partition 236 may serve to insulate the boiler and reservoir from each other or may conduct heat between them.

In each of Figures 1, 2 and 3, a non-return device is shown between the reservoir and the boiler. In Figure 1, that non-return device comprises a valve 16, in Figure 2 a float valve 134 is provided, and a non-return valve 216 is shown in Figure 3. In a modification (not shown), the non-return devices are omitted from the figures.

CLAIMS

1. A vapour generator including a boiler and a reservoir arranged to supply liquid to the boiler.

2. A vapour generator as claimed in Claim 1 in which the reservoir and the boiler are spaced from each other.

3. A vapour generator as claimed in Claim 2 in which the reservoir and the boiler are connected together whereby they are constrained to move together.

4. A vapour generator as claimed in Claim 1, 2 or 3 in which the reservoir and the boiler are provided in a single container.

5. A vapour generator as claimed in Claim 4 in which the container includes a portion on one side of which is located the reservoir and on the other side of which is located the boiler.

6. A vapour generator as claimed in Claim 5 in which the upper regions of the reservoir and the boiler are in communication with each other.

7. A vapour generator as claimed in any preceding claim in which the reservoir is arranged to supply liquid to the boiler *via* a one way valve.

8. A vapour generator as claimed in Claim 7 in which the one way valve comprises a float valve.

9. A vapour generator as claimed in any preceding claim in which the level of liquid in the boiler is arranged to be lower than that in the reservoir.

10. A vapour generator as claimed in any preceding claim including a pressure relief valve.

11. A vapour generator as claimed in Claim 10 in which the pressure relief valve is located in the reservoir.

12. A vapour generator as claimed in any preceding claim in which the reservoir includes means for preventing the reservoir from being completely filled with liquid.

13. A vapour generator as claimed in Claim 12 in which said means comprises a reservoir filling opening being located beneath the uppermost portion of the reservoir.

14. A vapour generator as claimed in any preceding claim in which the reservoir is arranged to supply liquid to the boiler at a location above the lowermost portion of the boiler.

15. A vapour generator as claimed in any preceding claim in which the lowermost portion of the reservoir is located above the lowermost portion of the boiler.

16. A vapour generator as claimed in any preceding claim in which the reservoir is

made of plastics material.

17. A vapour generator as claimed in any preceding claim in which at least a part of the reservoir is transparent.

18. A vapour generator as claimed in any preceding claim in which the capacity of the boiler is less than 5 litres.

19. A vapour generator as claimed in Claim 18 in which the capacity of the boiler is less than 4 litres.

20. A vapour generator as claimed in Claim 19 in which the capacity of the boiler is in the region of between 2 and 3 litres.

21. A vapour generator as claimed in any preceding claim in which the capacity of the reservoir is less than 15 litres.

22. A vapour generator as claimed in Claim 21 in which the capacity of the reservoir is in the region of 10 litres.

23. A vapour generator as claimed in any preceding claim which is portable.

24. A vapour generator substantially as herein described with reference to, and as shown in Figure 1 or 2 or 3.

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